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PHYSICAL CHEMISTRY.—*The statement of acidity and alkalinity, with special reference to soils.* EDGAR T. WHERRY, Washington, D. C.

In the course of observations on the acid and alkaline reactions of soils supporting the growth of native plants, which the writer has been making at odd times during the past several years, considerable attention has been paid to the method of presenting the results; and it has been concluded that the usual plans can be improved upon, especially from the point of view of their ease of comprehension on the part of workers in non-mathematical sciences. Certain suggestions in this connection are put forward in the present note.

Two different methods of stating reactions are in general use by chemists, the "concentration" and the "potential" methods. In the concentration method the number of gram equivalents of hydrogen-ion per liter is stated, usually as an integral power of 10 with a coefficient; in the potential method, the exponent of 10, stated to one decimal place (which is directly proportional to the electric potential produced by the hydrogen-ion) is used alone. Thus, the acidity of a given solution might be described as either 5.0×10^{-6} gram-equivalents of H^+ per liter, or as $P_H = 5.3$. It takes, however, considerable effort to appreciate the relative magnitude of quantities thus stated; to tell off-hand, for instance, whether 5×10^{-6} is greater or less than 6×10^{-5}; to realize that a solution with $P_H = 2.4$ is 6300 times as acid as one with $P_H = 5.6$; and to recognize whether a given solution is acid or alkaline in reaction without considering the relation of the exponent to 7 (that of a neutral solution).

The usefulness of methods in which computation begins at the neutral point in describing reactions has been urged by Walker and Kay for natural waters,[1] by L. J. Henderson[2] for biological fluids, and by the writer for soils.[3] The plan adopted by the first two authors has been criticized by Clark and Lubs[4] as "very inadequate," but that depends on the point of view. The methods here proposed, which represent an extension of those just referred to, are contrasted with the usual ones in table 1; they appear to the writer quite adequate to express the relations involved, and to possess several distinct advantages, as pointed out in the discussion of the table.

The first five columns of table 1 need no comment, as they represent simply a statement of well-known methods of describing reactions; but the remainder require some explanation. Under the proposed concentration method, as headings of columns 6 and 7 the terms *specific acidity* and *specific alkalinity*[5] are used, since the unit, instead of being 1 gram-equivalent per liter, as in the usual methods, is the number of gram-equivalents per liter of each ion present in a standard substance, namely pure water at ordinary temperature, which is practically 10^{-7}. The actual numbers corresponding to the powers of 10 representing the reactions likely to be met with in soils have been inserted in columns 6 and 7.

The headings of the potential columns are also new; as these values may well be called chemical potentials, the letter X, representing the Greek letter *chi*, the initial of *chemical*, is applied to them.[6] It may be noted here that only the first of these columns need be used, if in the definition of chemical potential the sign of the ion is included; that is, when a given number is

[1] Journ. Soc. Chem. Ind. 31: 1013. 1912

[2] Science 46: 73. 1917.

[3] Journ. Wash. Acad. Sci. 6: 675. 1916. 8: 591. 1918.

[4] Journ. Bacter. 2:14. 1917.

[5] WALKER and KAY called them *relative* acidities and alkalinities; the writer in previous publications has used the term intensity of acidity and alkalinity, but it is better to limit the conception of intensity to potentials. *Acidivity* and *alkalivity* might be used if desired.

[6] For the suggestion of this symbol, as well as for much additional assistance in the preparation of this paper, the writer is indebted to Dr. E. Q. ADAMS of the Bureau of Chemistry.

stated, it is understood that it is + when applied to a positive ion and — to a negative one.

In the last column are given descriptive terms for such reactions as are commonly met with in soils. In the study of soils associated with various native plants the writer has found that

TABLE 1

COMPARISON OF DIFFERENT METHODS OF STATING REACTIONS

General reaction	Usual methods: Concentration H^+	Usual methods: Concentration OH^-	Usual methods: Potential P_H	Usual methods: Potential P_{OH}	Proposed methods: Concentration Specific Acidity	Proposed methods: Concentration Specific Alkalinity	Proposed methods: Potential X_H	Proposed methods: Potential X_{OH}	Proposed descriptive terms
	10^{0}	10^{-14}	0	14	10^{7}	10^{-7}	7	—7	
	10^{-1}	10^{-13}	1	13	10^{6}	10^{-6}	6	—6	
	10^{-2}	10^{-12}	2	12	10^{5}	10^{-5}	5	—5	
	10^{-3}	10^{-11}	3	11	10^{4} (10,000)	10^{-4}	4	—4	Superacid
Acid	10^{-4}	10^{-10}	4	10	10^{3} (1000)	10^{-3}	3	—3	Mediacid
	10^{-5}	10^{-9}	5	9	10^{2}(100)	10^{-2}	2	—2	Subacid
	10^{-6}	10^{-8}	6	8	10^{1}(10)	10^{-1}	1	—1	Minimacid [a]
Neutral	10^{-7}	10^{-7}	7	7	10^{0}(1)	10^{0}(1)	0	0	Minimacid [a]
	10^{-8}	10^{-6}	8	6	10^{-1}	10^{1}(10)	—1	1	Minim alkaline
	10^{-9}	10^{-5}	9	5	10^{-2}	10^{2}(100)	—2	2	Subalkaline
	10^{-10}	10^{-4}	10	4	10^{-3}	10^{3} (1000)	—3	3	Medialkaline
Alkaline	10^{-11}	10^{-3}	11	3	10^{-4}	10^{4} (10,000)	—4	4	Superalkaline
	10^{-12}	10^{-2}	12	2	10^{-5}	10^{5}	—5	5	
	10^{-13}	10^{-1}	13	1	10^{-6}	10^{6}	—6	6	
	10^{-14}	10^{-0}	14	0	10^{-7}	10^{7}	—7	7	

[a] May be grouped together as "circumneutral."

certain more or less well-defined types of reaction can be recognized, and it seems desirable to have a special name to apply to each of these. Starting at the acid end of the series, and using for simplicity the numerical specific acidities and alkalinities, these are as follows:

Specific acidities greater than 1000 are shown only by bog-peat, which supports a characteristic flora of "oxylophytes" or acid-soil plants; for such reactions the term *superacid* may be used. Some bog-peats, many upland-peats, and other soils also supporting oxylophytes, show values of from 1000 down to 100; for these the term *mediacid* seems appropriate. Many ordinary woods soils and field soils are also acid, but to a degree so much smaller that typical oxylophytes do not grow in them; the specific acidities under such conditions range from 100 down to 10, and may be characterized by the well-known term *subacid*. The slight degree of acidity represented by numbers less than 10, for which *minimacid* is suggested, and the similar alkalinities up to 10, *minimalkaline*, are observed in woods and field soils, also associated with certain types of plants; there is no evidence of marked change in flora on passing the neutral point, so such reactions may in general be classed as *circumneutral*. The soils derived from limestone rocks under conditions where the lime is not extensively leached out, and also natural waters rising through calcareous materials, often show a specific alkalinity of from 10 to 100, and for them the term *subalkaline*, corresponding to that used on the acid side for a similar range, may be used. *Medialkaline* and *superalkaline* soils, using these prefixes in the same senses as was done on the acid side, are presumably met with in "alkali" regions where free sodium carbonate occurs.

It is realized that the division of reactions into groups of equal length in the above manner is a somewhat artificial and arbitrary procedure. No claim is made, however, that the dividing lines between the groups are actually important critical points, at which the growth of any large number of species ceases. This method of subdivision and nomenclature is merely put forward to fill what is believed to be a real need, namely, for a series of readily understandable and roughly quantitative terms which may be used in the description of the reactions of soils, especially in discussions of plant distribution.[7]

Certain advantages possessed by the proposed methods of stating reactions may now be indicated. The neutral point is

[7] An example of how the method works out in practice will shortly be published elsewhere.

clearly marked by the figure 0; the exponents of the H and OH ions present in a given solution differ only in sign, and solutions of equivalent acidity and alkalinity are described by numerically identical terms, which is not the case in the usual methods. But the most desirable feature appears to the writer to be the ease with which the relative magnitudes of reactions under comparison can be appreciated when the numerical specific acidities and alkalinities are used. For example, in a recent study of the occurrence of azotobacter in cranberry soils[8] it was found that untreated soils had P_H = 5.4 to 5.6, and limed soils 6.2 to 6.4. With this method of statement it is not apparent, without stopping to calculate it out, in what direction the reaction has been altered or how extensive the change has been. If the same data are stated by the proposed chemical potential method, however, X_H = 1.6 to 1.4 and 0.8 to 0.6 respectively; and when 10 is raised to these powers the corresponding numerical specific acidities are 40 to 25, and 6 to 4, showing directly and clearly that liming has reduced the acidity to about $^1/_6$ of its original amount.

In conclusion, it may be remarked that the proposed methods of describing reactions are by no means adapted only to work with soils; they may prove useful in other fields as well. It may be urged especially that the readiness with which the numerical specific acidities and alkalinities can be understood by workers in nonmathematical sciences should lead to favorable consideration of this method whenever results obtained by physical-chemical measurement are to be applied in other fields.

BOTANY.—*Intolerance of maize to self-fertilization.* G. N. COLLINS, Bureau of Plant Industry.

Of the important cultivated crop plants maize is perhaps the least tolerant of self-fertilization. Only one strain among hundreds that have been tested has yet been discovered, the vigor of which is not reduced by even a single generation of self-fertilization. Many strains that have been under investigation

[8] GAINEY, Science 48: 654. 1918.

require special care to keep them alive after four or five successive self-pollinations. In view of this serious limitation it seems remarkable that the species has developed no adequate means of avoiding self-pollination.

The staminate and pistillate flowers of maize are borne on different parts of the plant, but most varieties are synacmic, or at most slightly proterandrous, and as the staminate flowers are at the top of the plant it is only when winds continue during all the time pollen is being shed that self-pollination is avoided. It is obviously of advantage to a plant with the sexes disposed as in maize not to be entirely dependent on cross-pollination. But it appears almost equally obvious that a slight departure from synacmy toward proterogyny would be more advantageous than a similar departure in the direction of proterandry.

Maize may be successfully pollinated at any time within 5 to 10 days after the emergence of the silks. With a variety normally proterandrous, pollen continues to fall from a plant for one or two days after the silks emerge. If a period of calm prevails at this time, the ear will be fertilized by pollen from the same plant. Should there be wind during the forenoon, when most of the pollen is liberated, or if the plant be slightly more proterandrous, fertilization will be dependent on pollen from other plants, and if no foreign pollen is at hand the ear will be sterile. If, on the other hand, the silks were to appear before the pollen, there would be the same opportunity for cross-pollination as with proterandrous plants, and should no foreign pollen be available, pollen from the same plant beginning to fall while the silks were still receptive would give self-pollinated seed instead of a sterile ear.

From the behavior of varieties imported from the tropics it was at one time thought that the more primitive varieties of maize were more proterandrous, and that the practically synacmic nature of improved varieties was the result of intensive breeding.[1] As selection is usually practiced, markedly proterandrous individuals would be considered barren stalks and

[1] COLLINS, G. N. *A variety of maize with silks maturing before the tassels.* U. S. Dept. Agric. Bur. Pl. Ind. Circ. 107. February 7, 1913.

would be eliminated. It now appears, however, that the growing of a variety in a new environment may result in accentuating the proterandrous character. Since the investigations with primitive types have been conducted in this country with introduced material, it may be that the observed proterandrous tendency of these types is due largely to environmental causes. The idea that maize may be of hybrid origin makes possible another explanation of why maize is synacmic and at the same time intolerant of self-pollination.

Euchlaena, the nearest relative of maize and usually regarded as an ancestor, is not intolerant of self-fertilization. Comparisons of selfed and crossed strains of Euchlaena do not show a measurable reduction of vigor as a result of self-pollination, and there is no difficulty in maintaining vigorous selfed strains. In fact, as a result of the excessive branching that obtains in Euchlaena, a very large proportion of the seed is normally self-pollinated. Intolerance of self-fertilization is therefore among the characters of maize that must be sought outside Euchlaena.

If intolerance of self-pollination were derived from some other source than Euchlaena, it seems not unreasonable to suppose that the ancestor possessing this intolerance would have also some means of securing cross-fertilization, which is not necessary in Euchlaena. This means is suggested by another non-Euchlaena character, the tendency to produce perfect flowers or androgynous inflorescences which are proterogynous.

Whenever both stamens and pistils are developed in the same maize inflorescence, the silks appear before the pollen falls. This is true for both terminal and lateral inflorescences. Terminal inflorescences mature before the lateral, and since the normal pistillate inflorescence has the lateral position, the delay attendant on this position neutralizes the natural proterogyny, with the result that maize plants generally are synacmic or proterandrous. There is thus a sense in which maize is proterogynous, the proterandry being that of the plant instead of the individual flower or inflorescence and resulting from the separation of the sexes into different parts of the plant.

Whenever two plants with widely different characteristics are crossed, characters, which in either parent may be advantageous, may unite to make an unfavorable combination. It has been assumed that the plant which combined with Euchlaena to produce maize must have been perfect-flowered. It now seems reasonable to assume also that this other ancestor was adequately protected against self-fertilization by complete proterogyny.

If a perfect-flowered proterogynous plant with a terminal inflorescence were combined with Euchlaena, the inability to withstand self-pollination might be retained, while the segregation of the sexes to different parts of the plant would result in the practical loss of the proterogyny.

In view of these considerations, it is suggested as probable that the extreme intolerance of maize to self-pollination was introduced through a perfect-flowered ancestor and that in this ancestor the danger of self-pollination was guarded against by proterogyny.

ZOOLOGY.—*Recent zoological explorations in the western Arctic.*[1] RUDOLPH MARTIN ANDERSON, Biological Division, The Geological Survey, Ottawa, Canada. (Communicated by M. W. Lyon, Jr.)

The early explorers of this region—Hearne, Ross, Franklin, Dease and Simpson, Collinson, McClure and others—were usually naval officers or agents of the Hudson's Bay Company, and made very few observations on the animal life outside of occasional comments on the larger game animals or the few species important to the fur trade. The first really important zoological work to result from these explorations was done by Dr. John Richardson, who travelled in the western Arctic in 1821–23, 1826–27, and 1847–48, summarized in the accounts of these explorations, and in the monumental "Fauna Boreali-Americana."

[1] Abridged from a paper read before the Biological Society of Washington, April 5, 1919.

The next great naturalist in the north was Roderick MacFarlane, still living in Winnipeg, who, beginning in the late fifties and continuing until the nineties, enriched the United States National Museum with collections made in the Mackenzie basin and the region around Liverpool Bay and Franklin Bay. E. W. Nelson at St. Michaels and farther north from 1877 to 1881, and John Murdoch at Point Barrow in 1881–83, made very important contributions both to collections and to zoological literature. Other scientific collectors who reached spots on the western Arctic coast were Frederick Funston (about 1896), E. A. McIlhenny (1898), and Frank Russell (1894). David T. Hanbury (1904) and Roald Amundsen (1906–07) made some notes, but little in the way of zoological collections.

Mr. E. A. Preble, of Washington, although not strictly an Arctic worker himself, in 1908 summed up all previous Arctic zoological work and bibliography in his *Biological investigations of the Athabaska-Mackenzie Region* (North American Fauna, No. 27).

The speaker, in carrying on zoological collecting and exploration for the American Museum of Natural History in the Arctic from 1908 to 1912, visited practically all points on the Arctic coast from Point Barrow, Alaska, to Coronation Gulf, as well as many Arctic districts away from the coast, notably on both sides of the Endicott Mountains divide in Alaska, the Mackenzie delta, and the edge of the timber-line in the Great Bear Lake and Coppermine River region in Canada. The Canadian Arctic Expedition, 1913–16, covered a good part of the same region, although its activities were mainly on or near the coast. The first year's base (1913–14) was at Collinson Point, Alaska, and the base for the next two years on Dolphin and Union Strait, whence the territory was worked west to Darnley Bay and east to Bathurst Inlet. The southern branch of the expedition was prepared for both terrestrial and marine zoological work, and extensive collections of plants, insects, fishes, and invertebrates were made, as well as good series of the larger animal forms. The northern division of this expedition was mainly interested in geographical work and did very little zo-

ological work. The reports of this expedition are now being published by the Canadian government in extended form, the separates on each group being distributed as soon as printed.

The principal difficulties in Arctic zoological work are (1) difficulty of transportation; (2) limited fauna in winter; (3) limited scope for field work in each summer; (4) necessity of moving at best season for field work.

It is worthy of note that the eastern North American land fauna runs far to the westward along the Mackenzie River system. Traces of Western influences begin to appear in the Mackenzie delta.

Tongues of the Hudsonian life zone extend far beyond the Arctic Circle in places. The isothermal lines are very irregular.

The prevailing east and west migration along the Arctic coast brings some Pacific forms far east along the coast.

There is an extensive north and south bird migration along part of the Mackenzie system, the Anderson River, Liverpool Bay, and towards Banks Island.

There is little migration along the Coppermine River.

Traces of the Siberian fauna come across from Bering Strait and Kotzebue Sound to the Colville delta on the Alaskan Arctic coast.

There has evidently been a great diminution of some forms of bird life in the Arctic in recent years, the same as elsewhere, but this is not primarily due to destruction by natives, except perhaps in parts of western Alaska.

The reduction of game and fur animals is due principally to white men's influence, directly or indirectly. The numbers of individuals and conditions of existence of many species are rapidly changing over many large areas in the Arctic, and causing rapid and extensive shifting of native population.

The Arctic marine life is fairly uniform in circumpolar regions, the conditions of life being nearly uniform. Large series of terrestrial animals show that there is less variation of some species over large areas, than has been supposed.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

GEOLOGY.—*Geology and mineral deposits of the Colville Indian Reservation, Washington.* J. T. PARDEE. U. S. Geol. Survey Bull. 677. Pp. 180, 12 plates and 1 figure. 1918.

The rocks exposed are the Covada group which consists of schistose argillite, greenstone, and limestone of probable Carboniferous age; the intrusive Colville granite probably Cretaceous; dike rocks and lavas of Tertiary age; and Pleistocene glacial deposits.

The Pleistocene Cordilleran Ice cap overran all the Reservation except part of San Poil Valley. After the ice had withdrawn the valley of Columbia River was ponded to the present 1700 foot contour. This water body was displaced by the Nesplem Silt from which the river carved terraces as it re-excavated its channel. The Nesplem Silt is correlated with the White Silt formation of Dawson in Frazer valley, British Columbia.

The mineral deposits consist chiefly of veins that contain silver, lead, and zinc and contact metamorphic deposits valuable mainly for copper. Most of the known lodes of economic importance are confined within four more or less definite area near Nesplem, Park City, Covada, and Keller. With respect to rock formations, the lodes are about equally divided between the Colville granite and the Covada group. No metal-bearing lodes have been found in rocks younger than the Colville granite. Most of the veins are narrow, the oxidized zone is shallow, and secondary enrichment, though conspicuous in one or two mines, is not common. Some of the contact metamorphic deposits are large but of very low grade. J. T. P.

GEOLOGY.—*Relation of landslides and glacial deposits to reservoir sites in the San Juan Mountains, Colorado.* WALLACE W. ATWOOD. U. S. Geol. Survey Bull. 685. Pp. 38, 8 plates, 17 figs. 1918.

Inasmuch as experience has shown that many landslide masses and certain of the glacial deposits are not able to withstand the pressure of a high head of water without serious leakage, it seems desirable to publish a description of the mountain canyons and the deposits commonly found in them and of the geologic conditions associated with the lakes in the mountains, so that, in the future, no expensive errors need be due to a failure to recognize the geologic formations bordering a proposed reservoir site. Glacial deposits of the Wisconsin glacial stage are described in detail. Landslides and torrential deposits in larger canyons are discussed. Several reservoirs are described and illustrated in detail. R. W. STONE.

GEOLOGY.—*Geology and ore deposits of the Tintic mining district, Utah.* WALDEMAR LINDGREN and G. F. LOUGHLIN, with a historical review by V. C. HEIKES. U. S. Geol. Survey Prof. Paper No. 107. Pp. 282. 39 plates, 49 figures. 1919.

The report gives the result of a detailed re-survey of the Tintic district, results of the first survey by G. W. Tower, Jr., and G. O. Smith having appeared in the nineteenth annual report of the Survey in 1898. The scope of the report is similar to that of other Survey professional papers on mining districts, and particular attention may be directed to the following features:

Part I (by G. F. L.):—Revision of the stratigraphy based on newly-discovered paleontologic evidence, proving the existence of lower, middle, and upper (?) Cambrian, lower and upper Ordovician, upper (?) Devonian, and Mississippian strata; unconformities at the base of the Ordovician and of the Mississippian; description and correlation of igneous rocks, including early latite or andesite, early and late rhyolites, later latites and monzonite, and basalt; magmatic differentiation of the igneous rocks, comparing evidence for and against magmatic stoping, abyssal and marginal assimilation; folding and faulting, the latter taking place during 5 periods; rock alteration considered under three heads: (*a*) before volcanic activity (formation of chert, dolomite, and some sericite, and prevolcanic products of weathering); (*b*) during and immediately after volcanic activity; (*c*) distinctly later than volcanic activity.

Part II (by V. C. H.):—Gives history and production from 1869 to 1916, including production by ore zones and by kinds of ore; also the history of smelting and milling.

Part III (by W. L.):—Discusses relations of deposits to fractures in igneous and sedimentary rocks, showing selective replacement of limestone; underground water; mineralization, with particular attention to silicification of limestone and dolomite, paragenesis of ore and gangue minerals, horizontal and vertical zones of deposition, and processes of oxidation of different ores, genesis of the ore deposits; future of the district. Detailed descriptions of mines follow, and reconnaissance reports on the East Tintic and North Tintic districts are included.

G. F. L.

GEOLOGY.—*The Genesis of the ores at Tonopah, Nevada.* U. S. Geol. Survey Prof. Paper 104. EDSON S. BASTIN and FRANCIS B. LANEY. Pp. 47, 16 plates, 22 figs. 1918.

This investigation supplements the work of Spurr and Burgess by applying to the ores methods of microscopic study not in general use when these reports were prepared. The Tonopah district is underlain by a thick series of rocks that are products of volcanic activity and are believed to be of Tertiary age. In spite of complicated faulting most of the volcanic formations are rather flat-lying. In 1915 the Tonopah production of silver was exceeded in the United States only by that of Butte.

The bulk of the metal production of the district has come from ore bodies lying wholly within the Mizpah trachyte. Following are the more important conclusions:

1. The hypogene or primary ores have been modified in places by oxidation and enrichment through the agency of the air and oxygenated solutions originating at or near the surface. The high silver content of much of the ore obtained in the past and of some ore now remaining is unquestionably due in part to these processes.

2. There is evidence not only of recent oxidation of the ores but also of at least one period of ancient oxidation, and supergene sulphide enrichment was probably an accompaniment of each of these periods.

3. The rich silver ores now being mined at Tonopah are probably in the main of hypogene or primary origin.

4. Mining has shown that in certain veins the primary sulphides become less abundant with increasing depth, though the same species are present; mere increase in depth may account for this change in

some veins, for every vein must finally end in depth as well as laterally; in many veins change in wall rock has been at least a contributing factor. The veins developed by other deep workings are heavily mineralized and of high grade, and the geologic evidence is favorable to the persistence of rich primary silver ores to depths considerably greater than those yet attained in the mining operations.

Although hot ascending waters are encountered in a number of the deeper workings, there is little evidence that these waters are now depositing ores. R. W. STONE.

GEOLOGY.—*Coal south of Mancos, Montezuma County, Colorado.* A. J. COLLIER. U. S. Geol. Survey Bull. **691**-K. 16 plates, 2 figs. 1919.

There are two coal-bearing formations near Mancos, Colorado, the Dakota sandstone, in the lowlands north of the town, which yields a very impure coal of bituminous rank, and the middle formation of the Mesaverde group which yields a coal of somewhat lower rank than the Dakota coal, though relatively pure and much esteemed as a fuel.

The formations have a uniformly low dip to the south. The coal beds here described are all in the Menefee formation, are bituminous and are nearly all less than 6 feet thick. Three mines supply local demand. R. W. STONE.

GEOLOGY.—*Geology of the Lost Creek coal field, Morgan County, Utah.* FRANK R. CLARK. U. S. Geol. Survey Bull. **691**-L. Pp. 311–322, 1 plate, 1 fig. 1918.

The Lost Creek coal field lies in Morgan County, Utah, about 10 or 12 miles northeast of Devil's Slide Station, on the main line of the Union Pacific Railroad.

The coal bed, which is lenticular and varies greatly in thickness even in small areas, is confined to one coal-bearing zone. It is sub-bituminous and contains much moisture and many impurities in the form of small lenses or partings of bone and shale.

The rocks exposed in this field comprise two formations which differ widely in character as well as in age; the older formation is of Jurassic age and the younger of Tertiary age (Wasatch formation). These formations are separated by a great unconformity representing a long interval of time during which the older rocks were minutely folded and the folds were later truncated by erosion. The rocks that are here assigned to the Jurassic consist of limestone, shale, and well-indurated sandstone.

The rocks overlying the Jurassic unconformably are correlated with the Wasatch formation of Echo Canyon, and consist of an upper and a lower conglomerate and intervening sandstone and shale.

The structure of the Jurassic formation is intricate and complicated. The rocks are highly folded and may be faulted.

The Wasatch beds were laid down on the truncated edges of the Jurassic rocks and are now generally flat lying.

The coal in the Lost Creek field occurs in small areas and is generally too thin to be of economic value.

The Lost Creek coal, being inferior in rank to subbituminous coal of nearby fields, is not likely to receive serious attention.

R. W. STONE.

GEOLOGY.—*A geologic reconnaissance for phosphate and coal in southeastern Idaho and western Wyoming.* ALFRED REGINALD SCHULTZ. U. S. Geol. Survey Bull. **680**. Pp. 81, 2 plates, 8 figures. 1918.

Describes fully the stratigraphy of the region, embracing a geologic column from pre-Cambrian to Quaternary; describes the geologic structure briefly. The occurrence of phosphate rock in several localities is given in such detail as is possible from reconnaissance examination only, but it is apparent that in the Snake River Range, Bighole Mountains, and Teton Range, particularly along the east side of Teton Basin, a large amount of phosphate is present. The analyses show considerable variation but they indicate the presence of some high-grade ore that contains approximately the equivalent of 70 per cent of tricalcium phosphate. Beds of coal have been found at several localities in this field and are at present being mined in a few places. Most of the coal beds that have been exploited are of Cretaceous age, belong to the Frontier formation, and represent the northward extension of the coal beds which are so extensively developed and on which active mines are located in southern Lincoln County, Wyoming. Beds of coal are also found in rocks stratigraphically below the Frontier formation, which probably represent the Bear River coals that have been prospected in the vicinity of Sage, Wyoming, but on which no active mines are located. The coal is bituminous and rather free from impurities, and occurs in beds 1 to 4 feet thick. According to report some of it has been coked with fair success. Most of the coal is badly shattered, as would be expected in a region where so much faulting has taken place. Several sections and analyses are given. R. W. STONE.

GEOLOGY.—*The Upper Chitina Valley, Alaska.* FRED H. MOFFIT. U. S. Geol. Survey Bull. **675**. Pp. 80, 13 plates, 2 figs. 1918.

This report deals largely with the more purely scientific aspects of the geologic problems, discussing at considerable length the stratigraphy and the igneous rocks. It has been proved that the copper-bearing rocks, which have yielded valuable deposits in the lower Chitina Valley, occur also in the upper valley. It is also shown that the formations from which the Nizina placers have derived their gold occur in this region. On the other hand, no mineral deposits of proved value have yet been exploited in the upper Chitina basin. It must be said, however, that comparatively little prospecting has been done in this field.

R. W. STONE.

GEOLOGY.—*The Nelchina-Susitna Region, Alaska.* THEODORE CHAPIN. U. S. Geol. Survey Bull. **668**. Pp. 64, 10 plates, 4 figs. 1918.

Discusses the distribution, age, and correlation of the various geologic formations in a little-known region, and the development of its land forms. There has been but little productive mining in the region, and its geology does not encourage the hope of finding extensive placers, yet the wide distribution of alluvial gold indicates considerable mineralization. Moreover, the presence of a large number of intrusive igneous rocks also encourages the hope of finding local mineralization of the bedrocks.

R. W. STONE.

GEOLOGY.—*The Nenana coal field, Alaska.* G. C. MARTIN. U. S. Survey Bull. **664**. Pp. 54, 12 plates. 1919.

The Nenana coal field lies southwest of Fairbanks in the northern foothills of the Alaska Range. The rocks of the Nenana coal field consist of the coal-bearing beds, metamorphic and igneous rocks beneath the coal-bearing beds, and gravel, sands, and silts above them.

The coal-bearing strata consist of slightly consolidated sands, clays, and gravels with numerous beds of lignite. These beds are of Tertiary age. The coal-bearing beds rest unconformably upon Paleozoic (?) schist and igneous rocks and are overlain unconformably by Quarternary gravels, 1,500 or 2,000 feet thick.

The structure of the coal areas is fairly simple. The individual coal areas consist of shallow and gently warped basins in which the beds are at some places steeply folded or faulted against masses of crystalline

rock that separate the basins. No intrusive rocks are known to cut the coal measures.

The coal of the Nenana field occurs in many beds of different thickness, the thickest measuring perhaps 30 to 35 feet, which are distributed rather uniformly through the coal measures. At least twelve coal beds are of workable thickness, and six or more measure over 20 feet. The analyses show that the coal is a lignite of good grade, of about the same quality as that of Cook Inlet. R. W. STONE.

ORNITHOLOGY.—*Description of a new subspecies of the little yellow bittern from the Philippine Islands.* ALEXANDER WETMORE. Proc. Biol. Soc. Wash. 31: 83–84. June 29, 1918.

The form of *Ixobrychus sinensis* occurring on the Philippine Islands proves to be different from all the other races of this species, and, as it has no distinctive name, is to be known as *Ixobrychus sinensis astrologus* Wetmore. It is apparently most closely allied to *Ixobrychus sinensis bryani* (Seale), from the island of Guam in the Marianne group, from which it differs chiefly in its smaller size, darker upper parts, and paler neck. Its type is from Paete, Laguna, Luzon Island, Philippine Islands, and its range extends from the island of Luzon to Panay Island in the Philippine Archipelago. HARRY C. OBERHOLSER.

ORNITHOLOGY.—*The migration of North American birds. VI. Horned larks.* HARRY C. OBERHOLSER. Bird Lore 20: 345–349 (map). 1918.

The geographic distribution of the American horned larks extends from the Arctic Ocean to Bogotá, Colombia. Twenty-three subspecies are now distinguishable, most of which are resident. Five subspecies not currently recognized are here revived and their geographic distribution delineated. These forms are *Otocoris alpestris enthymia, Otocoris alpestris aphrasta, Otocoris alpestris leucansiptila, Octocoris alpestris, ammophila,* and *Otocoris alpestris enertera.* The map shows the distribution of all the American forms, and tables indicate the migration movements of the four forms that are most migratory. H. C. O.

ORNITHOLOGY.—*Birds of Glacier National Park.* FLORENCE MERRIAM BAILEY. General information regarding Glacier National Park, season of 1918. 52–64. 1918.

This list of 184 species and subspecies is reasonably complete for

the Glacier National Park. It comprises all the species heretofore authentically reported from the Park, together with many unpublished data from recent field work in this region. It may be regarded as a preliminary contribution, and contains only brief notes on each species and subspecies, including their manner and place of occurrence in the Park. HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Bones of birds collected by Theodoor de Booy, from kitchen-midden deposits in the islands of St. Thomas and St. Croix.* ALEXANDER WETMORE. Proc. U. S. Nat. Mus. **54**: 513–522, pl. 82. 1918.

A collection of seventy-three fragments of bird bones from kitchen-midden deposits on the islands of St. Thomas and St. Croix furnishes a number of interesting records. Among these remains thirteen species are represented, including three not identifiable more than generically. Nine species are attributed to the island of St. Thomas, including five not hitherto recorded. These five are *Puffinus lherminieri, Sula leucogastris, Fregata magnificens* [*rothschildi*], *Anous stolidus*, and an interesting new genus and species of the family *Rallidae*. The last mentioned is apparently most closely allied to the genera *Aramides* and *Gallirallus*, and is here named *Nesotrochis debooyi*. From St. Croix six species are recorded, of which *Sula piscator* [= *Sula sula*], *Nesotrochis debooyi*, and *Corvus leucognaphalus* were previously unknown from this island. The last is of particular interest, since no species of this genus has been recorded in the West Indies farther east than the island of Porto Rico. HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Attracting birds to public and semipublic reservations.* W. L. MCATEE. U. S. Dept. Agric. Bull. **715**: 1–13. 1918.

Birds exert a steady influence in reducing the numbers of injurious insects and other plant feeders, and should, for this reason, be particularly useful in public reservations. Birds are beneficial as enemies of a great variety of pests, and many observers claim that an abundance of birds on their grounds has kept down all the ordinary enemies of vegetation. They are, therefore, deserving of careful protection; and more attention should be given to attracting them to public and semipublic reservations such as national parks, national forests, national bird reservations, state parks, zoological gardens, the environs of res-

ervoirs and water works, boulevards, and roadsides. On the national reservations much could be done to attract waterfowl by planting suitable water plants which form a large part of the food of such birds, and by furnishing for upland game birds coverts which would also provide abundant food from their fruits. In public parks and zoological gardens the bird population may be very much increased by the proper installment of drinking places, bird boxes for breeding places, and feeding stations during the winter; nor should the planting of suitable trees and shrubs on parkways, boulevards, and along roadsides be neglected. Without much doubt the use of bird-attraction methods on such public and semipublic lands would benefit not only these areas but, through the increased destruction of injurious insects, also all the adjoining lands and the country at large.

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*The duck sickness in Utah.* ALEXANDER WETMORE. U. S. Dept. Agric. Bull. **672**: 1–26. 1918.

The annual losses from disease among wild fowl in the Salt Lake Valley, Utah, became so great that the Biological Survey began, in 1913, an investigation of the causes. Although for many years the ducks in the Bear River marshes, at the northern end of Great Salt Lake, have been known to be affected by a peculiar sickness, this did not become serious until 1910; but in that year so many thousand wild ducks died in this region that sportsmen and other persons interested in wild fowl became much alarmed over the situation. The same condition has been reported from other areas—Owens Lake, California, Tulare Lake, California, Lake Malheur, Oregon, Lake Bowdoin, Montana, and the Cheyenne bottoms near Great Bend, Kansas. The species affected in these various outbreaks comprise 36, and include many species of ducks, gulls, terns, shore birds, and other water-fowl, together with a few land birds such as *Pica pica hudsonia*, *Xanthocephalus xanthocephalus*, *Anthus spinoletta rubescens*, and even *Petrochelidon lunifrons lunifrons*.

The most conspicuous symptoms of this peculiar duck disease indicate a paralysis of the nerve centers controlling the muscular system. It is first noted in the inability of the bird to fly for any great distance, and finally in the lack of power to fly at all. The paralysis extends later to the legs and feet, then to the head and neck, so that the bird ultimately becomes entirely helpless.

Many theories were advanced regarding the cause of this peculiar malady. One of these attributed it to a bacterial or protozoan infection. Some persons claimed that the birds were poisoned by sulphurous or sulphuric acid from the smelters near Salt Lake City; and still other people contended that the sickness was due to the waste waters from the settling ponds of the sugar factories. A number of additional but much less plausible theories were also suggested. The investigations finally carried on about Great Salt Lake have clearly proved that the real cause is a toxic action of certain soluble salts found in alkali, such as the chlorides of calcium and magnesium. The birds take these into the system by feeding in water heavily charged with them, in places such as drying flats about the margin of Great Salt Lake, particularly in the Bear River region. Fresh water is the only cure, and this has been found effective in all cases of the sickness where the birds treated were not too far gone. Birds slightly affected and even many that were entirely helpless recovered nearly always when simply given moderately fresh water to drink. Since the cause of this disease over wide areas in the northern part of Great Salt Lake is the restriction of the inflow of fresh water, the chief possible means of alleviation must be found in the draining of the mud flats and the increase, somehow, of the inflow of fresh water.

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Notes on North American birds. VI.* HARRY C. OBERHOLSER. Auk 35: 463–467. 1918.

Examination of a series of specimens of the belted kingfisher shows that *Streptoceryle alcyon caurina* is a readily recognizable race by reason of its greater size alone. Although the American barn owl has been recently made a subspecies of the South American *Tyto perlata*, the comparison of a series of specimens with examples of the European races indicates that the North American bird is only subspecifically related to them, and that it must therefore stand as *Tyto alba pratincola*. All the American forms of *Certhia* are certainly but subspecies, and are undoubtedly forms of the European *Certhia familiaris*, not of *Certhia brachydactyla* Brehm, as claimed by a recent author. In a recent revision of the Paridae by Dr. C. E. Hellmayr, *Penthestes carolinensis* was made a subspecies of *Penthestes atricapillus*, but a close study of these birds in life and in the cabinet indicates that they are entirely distinct species. The race of Myrtle warbler described as

Dendroica coronata hooveri by Mr. R. C. McGregor has not been currently recognized, but a thorough study of a large amount of material proves that it is readily separable by both size and color. The redpoll known as *Acanthis hornemanni exilipes* Coues has recently been claimed to be a subspecies of *Acanthis linaria*, but since the two breed in the same localities over wide areas they must be specifically distinct.

H. C. O.

ORNITHOLOGY.—*Mutanda ornithologica. IV.* HARRY C. OBERHOLSER. Proc. Biol. Soc. Wash. 31: 125–126. November 29, 1918.

By the change of the generic name *Euphonia* to *Tanagra* the current names of several species and subspecies become untenable. By this transfer to the genus *Tanagra*, the *Euphonia vittata* of Sclater becomes preoccupied and is here named *Tanagra catasticta*. For a similar reason *Euphonia aurea pileata* Berlepsch is renamed *Tanagra aurea cynophora; Euphonia violacea magna* Berlepsch must be known under the new name, *Tanagra violacea pampolla* Oberholser; *Euphonia laniirostris peruviana* Berlepsch and Stolzmann must be called *Tanagra laniirostris zopholega* Oberholser; and *Euphonia olivacea* Desmarest must be replaced by *Tanagra minuta* (Cabanis). H. C. O.

ORNITHOLOGY.—*The migration of North American birds. II. The scarlet and Louisiana tanagers.* HARRY C. OBERHOLSER. Bird Lore 20: 16–19. 1918.

This paper contains tables of migration data for both spring and fall, together with the summer and winter distribution of *Piranga erythromelas* and *Piranga ludoviciana*. These data are from localities in the United States and Canada, and, as in the previous paper, cover the earliest, latest, and average dates of arrival and departure in both spring and autumn. H. C. O.

ORNITHOLOGY.—*Washington region* [*October to November, 1917*]. HARRY C. OBERHOLSER. Bird Lore 20: 22. 1918.

During October and November, 1917, notwithstanding the unusually cold weather, few northern birds made their appearance. Strangely enough some birds remained later than is common, and one species, *Pisobia minutilla*, broke all its records, remaining until November 22, nearly a month beyond its previous latest date. On the other hand,

Larus argentatus appeared on November 21, which is four days ahead of its previous earliest record. Some species were more than ordinarily numerous, among which might be mentioned *Sturnella magna magna* and *Oxyechus vociferus*.

ORNITHOLOGY.—*Annotated catalogue of a collection of birds made by Mr. Copley Amory, Jr., in northeastern Siberia.* J. H. RILEY. Proc. U. S. Nat. Mus. 54: 607–626. 1918.

Mr. Copley Amory, Jr., who accompanied the Koren Expedition to the Kolyma River of northeastern Sibera in 1914, made a collection of 228 birds. These were obtained at localities ranging from near the mouth of the Kolyma River to the Tomus Chaja Mountains, and are referable to 76 species and subspecies. This paper is an annotated catalogue of these, and includes the localities and dates where each species was observed or collected, together with remarks on plumage and the status of races, and Mr. Amory's field notes on habits and distribution. Some of the interesting results of the study of this collection are the substantiation of Mr. G. M. Mathews' division of *Canutus canutus* into three subspecies; of the recently described *Budytes flavus plexus* Thayer & Bangs; and of *Otocoris alpestris euroa* Thayer & Bangs. It is also worthy of note that the Lapland longspur occurring in the Kolyma district is much nearer *Calcarius lapponicus alascensis* than to *Calcarius lapponicus coloratus*. HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Description of a new subspecies of* Cyanolaemus clemenciae. HARRY C. OBERHOLSER. Condor 20: 181–182. September, 1918.

Examination of a series of *Cyanolaemus clemenciae* discloses the existence of a hitherto unrecognized subspecies, which will stand as *Cyanolaemus clemenciae bessophilus*. It differs from *Cyanolaemus clemenciae clemenciae* in its shorter bill, duller upper parts, and paler lower surface. It ranges from southeastern Arizona, southwestern New Mexico, central western Texas, south to the State of Chihuahua, Mexico, and in winter to Vera Cruz. H. C. O.

ORNITHOLOGY.—*Description of a new Lanius from Lower California.* HARRY C. OBERHOLSER. Condor 20: 209–210. November, 1918.

The breeding shrike from the southern two-thirds of Lower California, including the adjacent islands, proves to be subspecifically dis-

tinct from all the other races of the species. It is here named *Lanius ludovicianus nelsoni* in honor of Mr. E. W. Nelson, the Chief of the Biological Survey. H. C. O.

ORNITHOLOGY.—*The summer birds of the St. Matthew Island Bird Reservation.* G. DALLAS HANNA. Auk **34**: 403–410. October, 1917.

The St. Matthew Island Bird Reservation consists of three islands—St. Matthew, Hall, and Pinnacle. St. Matthew Island, which is the largest of these, is some 22 miles long by two to three miles wide, and rises to an altitude of 1800 feet. The weather-worn rocks are either devoid of vegetation or covered with a scant growth of mosses and other low plants. The information presented here was gathered on a trip of investigation for the Biological Survey in July, 1916. Altogether 37 species and subspecies are now known from these islands including four reported only by Dr. A. K. Fisher in 1899. Of all these only eight are land birds. Brief notes on the abundance and manner of occurrence are added under each species. The beautiful McKay snowflake, which is confined to these islands in the breeding season, is, it is satisfactory to note, still here the most abundant land bird of the level areas. HARRY C. OBERHOLSER.

ENTOMOLOGY.—*A revision of the North American Gracilariidae from the standpoint of venation.* CHAS. R. ELY. Proc. Ent. Soc. Wash. **19**: 29–77, pls. 6–9. 1918 (issued Sept. 1919).

This paper presents a new arrangement for the North American Microlepidoptera of the family Gracilariidae. It contains a generic synopsis in which great stress is laid on the venation, especially the position of vein 11 in the forewings. Three new genera are characterized and the other genera known to occur in our fauna are briefly described. A catalog of the species and a list of the food plants of the larvae adds to the usefulness of the paper. S. A. ROHWER.

ENTOMOLOGY.—*Idiogastra, a new suborder of Hymenoptera with notes on the immature stages of Oryssus.* S. A. ROHWER and R. A. CUSHMAN. Proc. Ent. Soc. Wash. **19**: 89–98, pls. 11 and 12. 1918 (issued Sept. 1919).

The oryssoid Hymenoptera have long been recognized as a well-defined group but with characters which indicated that they are in-

termediate between the generalized and specialized forms. The unusual larva and larval habits, together with adult characters, caused the authors to remove the oryssoids from the suborder Chalastogastra and place them in a new suborder. The paper includes detailed descriptions of the larva and pupa of *Oryssus occidentalis* Cresson and gives diagnostic characters for the new suborder. One unusual feature of the group is the long-exserted ovipositor of the pupa which in the adult becomes concealed within the body, extending anteriorly in an inverted position into the prothorax where it rights itself and follows nearly the same course back to the apex of the abdomen where it is hidden within the sheath. S. A. R.

ENTOMOLOGY.—*A contribution to the biology of North American Diptera.* CHAS. T. GREENE. Proc. Ent. Soc. Wash. **19:** 146–157, pls. 17–20. 1918 (issued Sept. 1919).

This paper contains detailed descriptions of the larvae and pupae of six species of flies, which are rather common in the District of Columbia, and includes notes on the habits of the immature stages. Good illustrations by the author accompany the article. S. A. ROHWER.

PALEONTOLOGY.—*Pliocene Foraminifera of the Coastal Plain of the United States.* JOSEPH AUGUSTINE CUSHMAN. U. S. Geol. Survey Bull. **676**. Pp. 98, 31 plates. 1918.

Two Pliocene formations are represented: The Waccamaw formation and the Caloosahatchee marl. Nearly all the species in all the material are identical with those found at the present time along our Atlantic coast, but those from the Waccamaw formation of North and South Carolina and also some of those from Shell Creek, Florida, are much more similar to the material now found north of Cape Hatteras, while the Caloosahatchee River material represents a typically tropical shoal-water fauna such as may be found about southern Florida and in shallow water about the West Indies.

The species of Foraminifera found in the later Miocene of the Coastal Plain of the eastern United States are described or recorded. An attempt has been made to include all records of the Foraminifera reported from the Atlantic and Gulf Coastal Plain from Alabama to New Jersey. The Miocene Foraminifera are not susceptible of so definite a division into faunas as the Pliocene Foraminifera. The species of the Maryland

and Virginia region are either identical with or allied to species now occurring in comparatively shallow water in the same general region.

R. W. STONE.

MYCOLOGY.—*Rhizoctonia in lawns and pastures.* C. V. PIPER and H. S. COE. Phytopathology 9: 89–92. February, 1919.

Brown patches in fine turf have long been known, and, as they commonly occur in midsummer, have usually been ascribed to "sun scald." Observation of the spots as they occurred in 1914 near Philadelphia furnished strong evidence that the cause was an organism, but the pathologists who studied specimens failed to disclose the causal agent. The abundant occurrence of the trouble in the vicinity of Washington in 1916 and since gave opportunity for study. The brown spots usually appear in summer with the advent of hot moist weather and are most conveniently studied on well-kept turf. The spots are at first small, but increase rapidly in a concentric fashion, reaching a definite size varying from a few inches to 2 or 3 feet in diameter, and then cease spreading. In the early morning a fine white mycelium may be observed over the discolored turf. Cultures from this as well as from sclerotia on the stems proved the fungus to be the well-known *Rhizoctonia solani*. From artificial culture it was easy to induce the formation of brown patches in grass turf under favorable weather conditions.

The fungus is known to attack an enormous list of herbaceous plants, but strangely enough has never been reported as attacking any grass, although there is one record of the occurrence of the mature form of the fungus (*Corticum vagum*) on maize.

Rhizoctonia is, however, very common in lawns and pastures and has been observed by the authors in many places from Minnesota to Maine and southward to the Ohio and Potomac Rivers. Among the plants attacked are redtop, red fescue, Rhode Island bent, carpet bent, velvet bent, Kentucky bluegrass, rough-stalked meadow grass, as well as many lawn weeds. Crab-grass and Bermuda grass seem perfectly immune, as is also white clover.

Most of the grasses slowly recover in the brown patches with the advent of cool weather in fall, but some are completely killed. Certain strains of carpet bent and velvet bent grown in pure cultures near Washington are especially injured by the disease but others are completely immune. Spraying at intervals with Bordeaux mixture helps protect the grass turf, but such applications need to be frequent.

C. V. P.

SCIENTIFIC NOTES AND NEWS

Dr. H. FOSTER BAIN resigned from the Bureau of Mines in May, and will sail from Vancouver on June 12 to continue his explorations in China for New York mining interests.

Professor JOSEPH BARRELL, professor of structural geology at Yale University, and a nonresident member of the ACADEMY, died on May 4, 1919, in his fiftieth year. Professor Barrell was born at New Providence, New Jersey, December 15, 1869. His early work was in mining engineering and in the geological department of Lehigh University, following which he entered the geological faculty of Yale in 1903. Taking up geology from the view-point of the engineer, he made many contributions to the science in the fields of structural geology, metamorphism, petrology of the igneous and metamorphic rocks, and sedimentation and peneplanation in their relation to the larger problems of the movements of the earth's crust.

Lieut. Col. ALFRED H. BROOKS, geologist in charge of Alaskan Mineral Resources, U. S. Geological Survey, who has been with the American Army in France since the summer of 1917, returned to Washington on April 28. He has received his discharge from the Army and is again taking up his geological work with the Survey.

Dr. J. WALTER FEWKES, chief of the Bureau of American Ethnology, returned in April from a visit to Texas, where he inaugurated explorations of aboriginal workshops and village sites near Austin, Round Rock, and Gatesville. The work is being continued by Prof. J. E. PEARCE of the University of Texas.

Mr. JAMES M. HILL, JR., is on leave of absence from the Geological Survey. He sailed from New Orleans early in April and is a member of a party engaged in prospecting for platinum in Colombia.

Dr. WALTER HOUGH left Washington in May for Arizona, to conduct ethnological and archeological explorations in the White Mountain Apache Reservation for the Bureau of American Ethnology.

Mr. CHARLES M. HOY, of the National Museum, left Washington on April 28 for Australia, to collect animals and other biological material for the Museum.

Mr. NEIL M. JUDD left Washington on May 14 for Utah, to make an archeologic reconnaissance of the Paria plateau, near the Grand Canyon of the Colorado.

Dr. J. C. MARTIN, assistant curator in the division of economic geology of the National Museum, resigned in May to accept a position with the Geological Survey.

Mr. EARL V. SHANNON has been appointed Assistant Curator in the Department of Geology of the National Museum.

Capt. D. L. WILLIAMS, formerly of the Chemical Warfare Service, and stationed at the American University Experiment Station, is now in Utica, New York.

Major O. B. ZIMMERMAN, formerly liaison officer between the Army Engineer Corps and the Bureau of Standards, is now with the International Harvester Company in Chicago.

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Prof. J. C. MERRIAM will be acting chairman of the Council until July 1, 1919. Major A. O. LEUSCHNER is acting chairman of the Division of Physical Sciences until July 1, during the absence of Dr. C. E. MENDENHALL as Scientific Attaché to the American Embassy in London. Mr. G. H. CLEVENGER is acting chairman of the Division of Engineering during the absence of Dr. H. M. HOWE as Scientific Attaché to the American Embassy in Paris. Prof. E. W. WASHBURN is acting chairman of the Division of Chemistry and Chemical Technology until July 1, during the period of Col. W. D. BANCROFT'S service with the Army. No chairman has been elected for the Division of Geology and Geography. The organization of the Division of Medical Sciences and the Division of Anthropology and Psychology has not yet been completed.